

Alien flora of Turkey: checklist, taxonomic composition and ecological attributes

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Academic editor: I. Kühn | Received 28 February 2017 | Accepted 24 April 2017 | Published 2 June 2017

Citation: Uludağ A, Aksoy N, Yazlık A, Arslan ZF, Yazmış E, Üremiş I, Cossu TA, Groom Q, Pergl J, Pyšek P, Brundu G (2017) Alien flora of Turkey: checklist, taxonomic composition and ecological attributes. *NeoBiota* 35: 61–85. <https://doi.org/10.3897/neobiota.35.12460>

Abstract

The paper provides an updated checklist of the alien flora of Turkey with information on its structure. The alien flora of Turkey comprises 340 taxa, among which there are 321 angiosperms, 17 gymnosperms and two ferns. Of the total number of taxa, 228 (68%) are naturalized and 112 (32%) are casual. There are 275 neophytes (172 naturalized and 103 casual) and 61 archaeophytes (52 naturalized and 9 casual); four species could not be classified with respect to the residence time. In addition, 47 frequently planted taxa with a potential to escape are also listed. The richest families are *Asteraceae* (38 taxa), *Poaceae* (30), *Fabaceae* (23) and *Solanaceae* (22). As for the naturalized alien plants, the highest species richness is found in *Asteraceae* (31 taxa), *Poaceae* (22), *Amaranthaceae* (18) and *Solanaceae* (15). The majority of alien taxa are perennial (63.8% of the total number of taxa with this life history assigned, including those with multiple life histories), annuals contribute 33.8% and 2.4% are biennial aliens. Among perennials the most common life forms are phanerophytes, of which 20.3% are trees and 12.6% shrubs; woody vines, stem succulents, and aquatic plants are comparatively less represented. Most of the 340 alien taxa introduced to Turkey have their native ranges in Americas (44.7%) and Asia (27.6%). Of other regions, 9.1% originated in Africa, 4.4% in Eurasia, 3.8% in Australia and Oceania and 3.5% in the Mediterranean. The majority of taxa (71.9%) were introduced intentionally, whereas the remaining (28.1%) were introduced

accidentally. Among the taxa introduced intentionally, the vast majority are ornamental plants (55.2%), 10.0% taxa were introduced for forestry and 6.7% as crops. Casual alien plants are most commonly found in urban and ruderal habitats (40.1%) where naturalized taxa are also often recorded (27.3%). Plants that occur as agricultural weeds are typically naturalized rather than casual (16.0% vs 7.1%, respectively). However, (semi)natural habitats in Turkey are often invaded by alien taxa, especially by those that are able to naturalize.

Keywords

Alien flora, Turkey, casual and naturalized alien plants

Introduction

Turkey has a long tradition of floristic research and as a result its native flora is satisfactorily investigated. With more than 12,000 plant taxa (Davis 1965–1985, Davis et al. 1988, Güner et al. 2000, 2012) and new species being continuously described, including new endemics (Güner et al. 2012, Özhatay et al. 2013, 2015), the flora of Turkey is the richest among the Mediterranean, European and neighbouring countries (Ekim and Güner 1986). The majority of this total number is represented by native taxa with 31% of endemics (Güner et al. 2012). Turkey's landscape and ecological diversity has contributed not only to a high floristic richness, but has also allowed for successful introductions and cultivation of a great number of crops, fruit species (Ercisli 2004) and forest trees (Atalay et al. 2014).

On the contrary, up to now there was only limited information on Turkish alien flora. Being located at the crossroads of three continents, there has always been an intense movement of humans and goods across Turkey over the history due to human migration, and in modern Turkey both plants and animals were being introduced intentionally and unintentionally in great quantities. Suitable conditions for the cultivation and use and subsequent naturalization of plants introduced into the country are supported historically. Turkey is a country of special significance in the history of agriculture, with some of the earliest sites of plant domestication nearly 10,000 years ago (Aksoy and Oksar 2015), and today 50% of the country area is agricultural land (FAO 2017).

With this background, it is somewhat surprising that so far, the main source of information about alien flora of Turkey was a checklist generated for the DAISIE project (Delivering Alien Invasive Species Inventories for Europe, 2004–2008; see DAISIE 2008, Lambdon et al. 2008), based on the several decades old flora (Davis 1965–1985) that was rather outdated in terms of inventory of alien species. Therefore, the DAISIE project reported only 220 alien taxa for Turkey, of which only 95 were assigned the naturalization status with certainty (Lambdon et al. 2008), which is an underestimation of the real situation. In fact, it should be taken into account that DAISIE included mainly the European part of Turkey, which represents only 3% of the Turkish territory. More recently, new insights into this aspect were provided by the book “Türkiye İstilâcı Bitkiler Kataloğu” (Catalogue of the invasive plants of Turkey) by Önen (2015).

However, such lack of a recent account on the alien flora represents a serious constraint to the management of those plants that are currently invasive or may become so in the future. As generally agreed, alien species lists form the basis for much of the current research on biological invasions, for guiding legislation and code of conducts, as input to decision making and risk assessment and in the formulation of management policies and strategies for nature conservation (Hoffmann and Broadhurst 2016, Woodford et al. 2016, Jacobs et al. 2017). From the scientific point of view, macroecological analyses of alien floras has received much attention recently and improved the understanding of historical flows of alien species among continents (van Kleunen et al. 2015), the dynamics of their accumulation (Seebens et al. 2017) as well as factors driving the variation in regional diversity of alien floras (Pyšek et al. 2009, 2010, 2015, Essl et al. 2011, Seebens et al. 2015).

The aim of this paper is therefore to fill the important gap in the knowledge on alien flora in one of the richest in species countries in Eurasia, by compiling the first comprehensive list of alien plants in Turkey and providing an analysis of its taxonomic composition, origin and ecological structure.

Methods

Study area

Turkey is a large and diverse country located between 25°40' to 44°48'E, and 35°51' to 42°06'N. The total area is 814,578 km² of which 97% is located in Asia and 3% in Europe. It is divided into seven geographical regions: Black Sea, Eastern Anatolia, South Eastern Anatolia, Mediterranean, Aegean, Marmara and Inner Anatolia. The average altitude is 1,141 m a.s.l., and it increases from West to East; 18% of Turkey is below 500 m and 25% between 500 and 1,000 m. Plains up to 2,000 m of altitude and high plateaus up to 2,500 m are another source of biodiversity of native plants while providing potential diverse niches for the naturalization of alien species. Turkey's natural environment is very diverse in terms of climate, ranging from subtropical to cold temperate, as well as topography and geology (Atalay 2002, 2010, 2011), supporting a variety of vegetation types (Akman and Ketenoglu 1986). Annual precipitation varies from 300 to 2,000 mm, and mean annual temperature from 4 to 19 °C. Some areas are prone to frosts for almost 10 months, while some have frost for only one day in a year. The growing period varies from almost the whole year to less than 140 growing days. Turkey is surrounded by an 8,333 km coastline with Black Sea at the North, Marmara Sea between two peninsulas, and Aegean Sea at West and Mediterranean at South. The coastal areas represent a dynamic, ecologically fragile environment with threatened habitats in which a diverse range of human activities are carried out (Acar et al. 2014). In addition, the majority of Turkey's ever-increasing population resides in coastal areas (Erginöz and Doğan 1997). Among cities that represent important points of entry of alien species into the country, İstanbul with a population of almost 15 million is Turkey's most populated metropolitan area and the economic powerhouse of the country. Its geographical

characteristics and topography allow for the existence of diverse microclimatic zones to exist in a relatively small area of 5,461 km² (Güneralp et al. 2013). The 2,875-km long border of Turkey with its neighbours Georgia, Armenia, Azerbaijan, Iran, Iraq, Syria, Greece and Bulgaria is associated with a high probability of entry and occurrence of alien plant species in habitats along adjacent roadside corridors that represent an important pathway for alien plants (Wilson et al. 2016).

Data sources used to compile the inventory

The first flora dedicated to Turkey is composed of the five volumes of Boissier's *Flora Orientalis* (Boissier 1867–1884) and its supplement (Boissier 1888) where alien species are occasionally reported. However, the basic data source used for the present inventory is the Flora of Turkey and the East Aegean Islands (Davis 1965–1985, Davis et al. 1988, Güner et al. 2000, 2012). This source has been complemented with information extracted from all the available literature, such as, in particular, the papers published after 2000 in the Turkish Journal of Botany and elsewhere. In addition, dedicated studies (Uremis et al. 2014, Arslan et al. 2015) and field surveys (e.g. Brundu et al. 2011) were taken into account as well as herbarium samples stored at the Düzce University Forestry Faculty Herbarium (DUOF) and other herbaria in Turkey (GAZİ, ISTO, AİBO and ISTE). We also screened the GBIF database, which holds 265,818 plant records for Turkey (GBIF 2017); however, alien plant species are significantly underrepresented in this source. We also used information from an ongoing project dedicated to the online flora of Turkey (Tübives – <http://www.tubives.com/index.php>) (Bakis et al. 2011), an initiative for a new Flora of Turkey with illustrations 'Resimli Türkiye Florası Volume 1' (Güner 2014), and 'Bizim Bitkiler' (<http://www.bizimbitkiler.org.tr/v2/index.php>), another online flora of Turkey which includes the last checklist of vascular flora of Turkey by Güner et al. (2012).

Classification of taxa and their characteristics

This inventory focuses on plant species alien to Turkey (synonyms: exotic, introduced, non-indigenous, non-native), i.e. species present in the country because human actions enabled them to overcome fundamental biogeographical barriers (Richardson et al. 2000, Blackburn et al. 2011); they occur in Turkey as a result of intentional or accidental introduction by humans, or as a result of natural spread from other regions where they were introduced by humans. Crosses resulting from hybridization with one or both alien species involved are also considered alien (Pyšek et al. 2004). In addition, we included in this inventory some taxa that are native to a part of the country but introduced elsewhere in Turkey, i.e. alien in Turkey, following an approach proposed by Lambdon et al. (2008) for Europe.

We classified alien plant species according to the stage they reached along the introduction-naturalization-invasion continuum (Richardson and Pyšek 2006, Richardson et al. 2000, 2011, Blackburn et al. 2011). However, due to a lack of data on the rate of spread we did not classify species as invasive and only classified them in two main categories, casual or naturalized. The complete inventory (Suppl. material 1: Table 1) lists also additional species that are presently recorded only in cultivation outside urban areas, but over very large areas, such as tree species in planted forests, and that could start to naturalize in the future due to potentially strong propagule pressure or climate change. These species are, however, not taken into account for data analyses. Taxa were further classified with respect to their residence time, i.e. separated into archaeophytes and neophytes (see e.g. Pyšek et al. 2004, 2012 for delimitation). Affiliation of taxa to families follows the approach of the Angiosperm Phylogeny Group (Stevens 2001 onwards, APG IV 2016). Plant names have been verified using IPNI (International Plant Name Index, <http://www.ipni.org/>), The Plant List (2010, version 1, published on the Internet; <http://www.theplantlist.org/>), WCSP and the African Plants Database (APD, version 3.4.0), updated by the Conservatoire et Jardin botaniques de la Ville de Genève and the South African National Biodiversity Institute, Pretoria, South Africa (<http://www.ville-ge.ch/musinfo/bd/cjb/africa>). We followed, to our best attempt, the accepted and correct nomenclature according to current taxonomic standards.

Information on life history, region of origin, pathway of introduction (intentional vs accidental) and habitat affiliation was extracted from literature and from the above cited sources for each species.

Life forms were classified as follows: therophytes, hydrophytes, chamaephytes, geophytes, hemicryptophytes and phanerophytes (Raunkiaer 1934, 1937). In addition, growth form and life history were assigned according to the Thesaurus of Plant Characteristics for Ecology and Evolution (Garnier et al. 2017) and other specific literature (Pérez-Harguindeguy et al. 2016). Growth-forms reported for aquatic plants follow Brundu (2015).

The checklist has been archived on the Global Biodiversity Information Facility (Uludag et al. 2017).

Statistical analysis

Differences in representation of life forms within casual and naturalized species were tested by contingency tables with control for overdispersion (if needed using quasi-Poisson distribution) (Crawley 2007). To test individual differences among life forms and species groups, adjusted standardized residuals of G-tests were compared with critical values of a normal distribution (Řehák and Řeháková 1986). All analyses were performed in R 3.0.2 (R Core Team 2015).

Results

Species numbers and taxonomic composition

The alien flora of Turkey comprises 340 taxa, among which there are 321 angiosperms, 17 gymnosperms and two ferns. Of the total number of taxa, 228 (67.1%) are naturalized and 112 (32.9%) are casual (Appendix 1; for the complete list of taxa, which includes additional 47 frequently planted taxa noted above, see Suppl. material 1). Related to the total plant diversity of ~12,000 species in the Turkish flora, the contribution of alien taxa is ~2.8% and that of naturalized taxa ~1.9%. Of the taxa for which the classification according to residence time was possible, there are 275 neophytes (172 naturalized and 103 casual) and 61 archaeophytes (52 naturalized and 9 casual).

Turkey's alien flora includes representatives of 92 families and 251 genera. There are seven families with at least 10 aliens that together comprise 44.7% of the total alien taxa richness of the country; the richest are *Asteraceae* (38 taxa, corresponding to 11.2% of all aliens), *Poaceae* (30, 8.8%), *Fabaceae* (23, 6.8%) and *Solanaceae* (22, 6.5%). As for the naturalized alien plants, the highest species richness is found in *Asteraceae* (31 taxa, 13.6% of the total number of naturalized aliens), *Poaceae* (22, 9.6%), *Amaranthaceae* (18, 7.9%) and *Solanaceae*. Over a half of the naturalized alien richness (51.8%) is concentrated in eight families that contain more than four naturalized taxa (Table 1).

The most represented genus is *Amaranthus* with 13 taxa that are all naturalized, contributing thus 3.3% and 5.7% to all aliens and naturalized aliens, respectively. *Solanum* is also rather rich in aliens, but of the 11 taxa only five are naturalized. Other genera, that are represented by more than five species and the naturalization success of their representatives is high, are *Euphorbia* (88.9% of all aliens in the genus are naturalized), *Acacia* (83.3%) and *Oxalis* (100%). The 11 genera with at least four alien taxa in Turkey together account for 17.6% of the total alien plant richness and 26.3% of the naturalized richness of the country (Table 2).

Ecological attributes

The majority of alien taxa are perennial (63.8% of the total number of taxa with this life history assigned, including those with multiple life histories), annuals are also greatly represented (33.8%) and only 2.4% are biennials. Among perennials the most common life forms are phanerophytes, i.e. trees (20.3%) and shrubs (12.6%); woody vines, stem succulent, bambusoid and aquatic plants are comparatively less represented. There were significant differences in the counts per life history between casuals and naturalized species ($\chi^2 = 29.85$, $DF = 0,6$, $p < 0.001$). This significant difference was due to annuals (therophytes) where the observed counts were higher than expected by chance for naturalized species and lower for casuals and due to woody species (phanerophytes) where the situation was reversed (Figure 1).

Table 1. The most represented families in the alien flora of Turkey, ranked according to the total number of alien taxa, with their representatives classified according to their status. For each family, the number of casual and naturalized taxa and the percentage of naturalized among total aliens are provided. Family names follow APG classification (Stevens 2001 onwards, APG IV 2016).

Family	Total no. of alien taxa	No. of casual taxa	No. of naturalized taxa	% of naturalized taxa
<i>Asteraceae</i>	38	7	31	81.6
<i>Poaceae</i>	30	8	22	73.3
<i>Fabaceae</i>	23	11	12	52.2
<i>Solanaceae</i>	22	7	15	68.2
<i>Amaranthaceae</i>	18	0	18	100.0
<i>Euphorbiaceae</i>	11	1	10	90.9
<i>Rosaceae</i>	10	6	4	40.0
<i>Cupressaceae</i>	9	3	6	66.7
<i>Pinaceae</i>	8	4	4	50.0
<i>Oxalidaceae</i>	7	0	7	100.0
<i>Sapindaceae</i>	7	2	5	71.4
<i>Convolvulaceae</i>	6	2	4	66.7
<i>Aizoaceae</i>	5	0	5	100.0
<i>Apocynaceae</i>	5	2	3	60.0
<i>Moraceae</i>	5	3	2	40.0

Table 2. The most represented genera in the alien flora of Turkey, classified according to their status. For each genus, number of casual and naturalized taxa and percentage of naturalized among total aliens in the genus are provided. Genera are ranked according the total number of alien taxa.

Genus	Total no. of alien taxa	No. of casual taxa	No. of naturalized taxa	% of naturalized taxa
<i>Amaranthus</i>	13	0	13	100.0
<i>Solanum</i>	11	6	5	45.5
<i>Euphorbia</i>	9	1	8	88.9
<i>Oxalis</i>	7	0	7	100.0
<i>Acacia</i>	6	1	5	83.3
<i>Acer</i>	4	1	3	75.0
<i>Bidens</i>	4	0	4	100.0
<i>Cotoneaster</i>	4	1	3	75.0
<i>Erigeron</i>	4	0	4	100.0
<i>Ipomoea</i>	4	0	4	100.0
<i>Paulownia</i>	4	4	0	0.0
<i>Physalis</i>	4	0	4	100.0

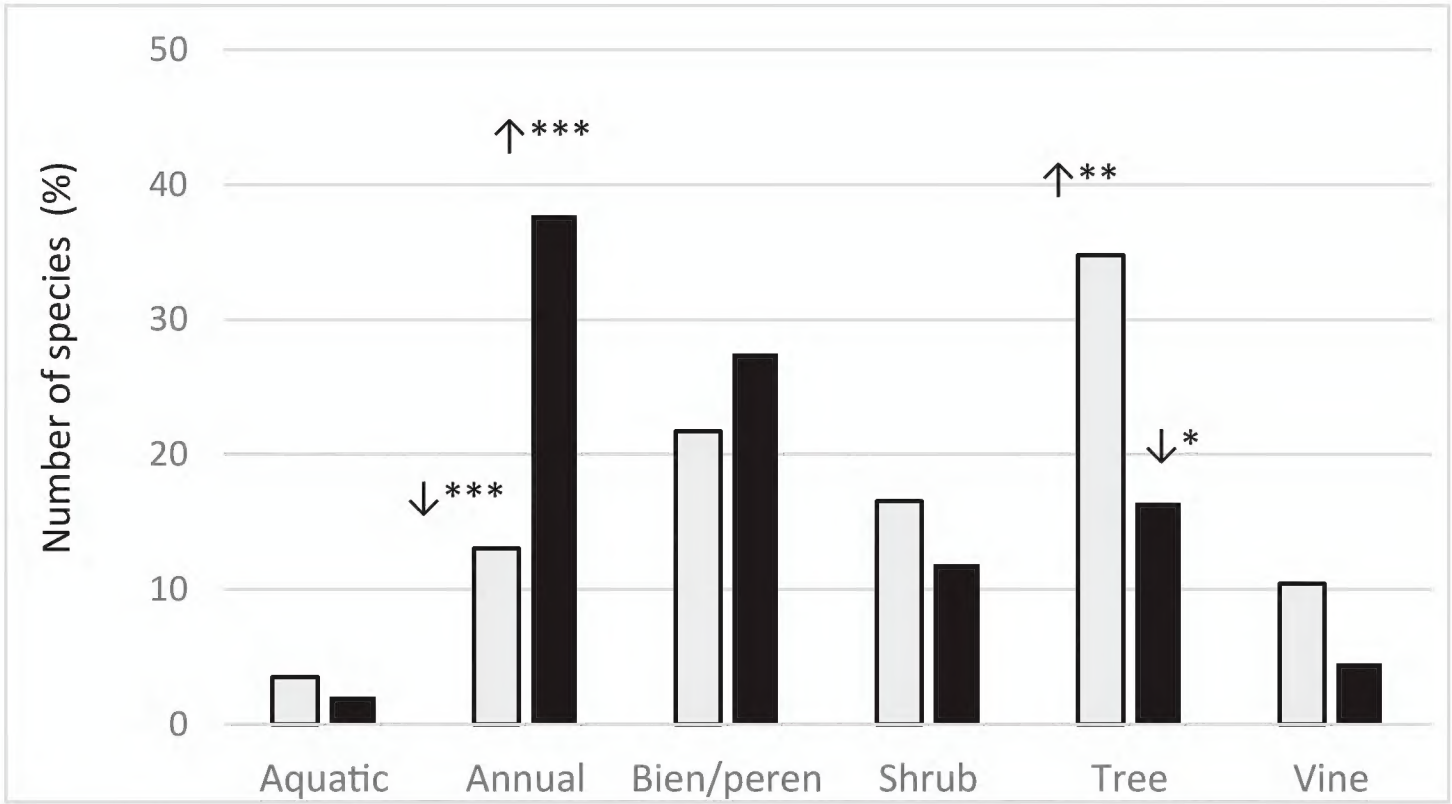


Figure 1. Frequency of alien species in the flora of Turkey categorized according to their Raunkiaer’s life forms, shown separately for casuals (white bars, n = 112) and naturalized taxa (black bars, n = 228). Bars indicate the percentage contribution of each life form to the total numbers of incidences within casual and naturalized. Significant differences and their directions are indicated above bars (. < 0.1, * < 0.05, ** < 0.01, *** < 0.001).

Table 3. Structure of the alien flora of Turkey according to origin and number of casual and naturalized species, with percentages of naturalized taxa among total aliens.

Native range	Total no. of alien taxa	No. of casual taxa	No. of naturalized taxa	% of naturalized taxa
America	152	48	104	30.6
Asia	94	33	61	17.9
Africa	31	13	18	5.3
Eurasia	15	2	13	3.8
Australia & Oceania	13	8	5	1.5
Mediterranean	12	1	11	3.2
Europe	9	1	8	2.4
Garden origin & hybrids	8	5	3	0.9
Other & unknown	6	1	5	1.5

Most of the 340 alien taxa introduced to Turkey have their native ranges in Americas (44.7%) and Asia (27.6%). Of other regions, 9.1% originated in Africa, 4.4% in Eurasia, 3.8% in Australia and Oceania, and 3.5% in the Mediterranean (see Table 3 for species numbers with respect to the area of origin).

The majority of taxa in the Turkish alien flora (71.9%) were introduced intentionally, whereas the remaining (28.1%) were introduced accidentally. Among the taxa

Table 4. Habitats in which the alien plant taxa are found in Turkey, shown separately for casual and naturalized taxa, with percentages of the total shown for each category. Natural/semi-natural habitats include the categories of the CORINE Land cover class 3 (Forest and semi-natural areas).

Habitat	Casual alien	%	Naturalized alien	%
Natural/semi-natural habitats	56	28.4	145	28.3
Urban/ruderal habitats	79	40.1	140	27.3
Coastal habitats	34	17.3	96	18.7
Agricultural land	14	7.1	82	16.0
Riparian habitats/wetlands/lakes	14	7.1	50	9.7

introduced intentionally, the vast majority are ornamental plants (55.2%), 10.0% taxa were introduced for forestry (planted forest, reforestation, sand dune stabilization or soil protection) and 6.7% as crops (i.e. plant taxa cultivated for the production of food, forage, fruit, fibre, dye or drugs).

Casual alien plants are most commonly found in urban and ruderal habitats (40.1% of their total number) where naturalized taxa are also often recorded (27.3%). Plants that occur as agricultural weeds are typically naturalized rather than casual (16.0% vs 7.1%, respectively). However, (semi)natural habitats in Turkey are often invaded by alien taxa, especially by those that are able to naturalize (Table 4).

Discussion and conclusions

This is the first comprehensive compilation and analysis of all available records on alien plant taxa in Turkey. It provides the first assessment of their status, introduction purposes and main types of invaded habitats. It also pinpoints knowledge gaps in the geographic and biogeographic distribution and the quantification of environmental and economic impacts.

The total number of the alien taxa reported for Turkey here (340) is relatively low compared to other Mediterranean and Southern European countries, namely France (1,258 taxa), Italy (1,023), Spain (933) and Portugal (547) (Lambdon et al. 2008, Celesti-Grapow et al. 2009) and numerically comparable with Greece (343; Arianoutsou et al. 2010, Dimopoulos et al. 2016). The same is true for the naturalized species richness in Turkey (228 taxa), for which higher numbers are reported for e.g. France (732), Spain (495) or Italy (440), but comparable numbers for Portugal (261) and lower for Greece (134) (Lambdon et al. 2008). This fact, together with the remarkably high richness of native flora of Turkey, makes the contribution of alien species to the total plant diversity of the country relatively low, with the values between 1.9 and 2.8% being by an order of magnitude lower than in some other European countries (e.g. Pyšek et al. 2012) or this continent as a whole. Europe, with a comparable native plant diversity as Turkey, ~10,000 native species (Winter et al. 2009), harbours 1,780 naturalized aliens from overseas and if one considers also intracontinental aliens

the number reaches 3,749 taxa (Lambdon et al. 2008) or 4,140 according to the most recent account in GloNAF database (van Kleunen et al. 2015).

This is the first comprehensive catalogue for Turkey and it is based mainly on literature and herbarium data, with only a limited number of dedicated field surveys. Other Mediterranean countries such as France, Italy or Spain have a longer tradition of floristic research on alien plants, whose appearance and establishment have long been documented by botanists there (e.g., by Saccardo 1909). It is therefore possible that casual species are underestimated in the dataset, as casuals in general, and escaped ornamentals in particular (Pergl et al. 2016b), are rarely recorded in botanical works nor are they often collected in herbaria. Another possible explanation for the lower number of alien plants than in some other European countries is that although cultivation of ornamental plants dates back to ancient times, there has been rapid development and change in the ornamental plants sector in Turkey only after the 1980s and this development has gained speed only in the 2000s (Çelik and Arisoy 2013).

The rate of naturalization (proportion of naturalized to all aliens) is 67% in Turkey, i.e. the same as in Cyprus but higher than in Greece (41%), Spain (53%), Portugal (47%) and Italy (51%) (Arianoutsou et al. 2010). On the contrary, with the exception of Bulgaria, there is only very limited knowledge on the alien flora of Georgia, Armenia, Azerbaijan, Iran, Iraq, Syria which impedes comparisons between these countries and, at the same time, forecasting of future trends for the entire Mediterranean region.

National inventories of alien plants are one of the key components for evaluating the status of biodiversity in a given country, as well as threats to endangered species, and provide source data for creating relevant indicators (Lambdon et al. 2008, Celesti-Grapow et al. 2010, Pyšek et al. 2012, van Kleunen et al. 2015, Latombe et al. 2017). Such data are needed for early warning systems, prioritization of management and implementation of effective policy measures (Brunel et al. 2010). The publication of checklists also helps neighbouring countries and trading partners to assess the threat from potential invasions of new species to arrive and checklists can contribute to so-called horizon scanning exercises looking for potential new threats (Roy et al. 2014, Latombe et al. 2017).

Identifying those species that represent potential or future threats, while still at an early stage of invasion, represents a major challenge for prediction (Lambdon et al. 2008, Brunel et al. 2010). Detailed knowledge of the pool of alien naturalized species from which emerging invaders recruit can provide national authorities in Turkey with an instrument for prioritization of management measures and allocation of resources to those species where future spread, and environmental and socioeconomic impacts are likely to occur (Brunel et al. 2010, Pergl et al. 2016a, Rumlerová et al. 2016). The results of the present research will increase the awareness of alien plant taxa in Turkey and neighbouring countries and trigger further dedicated specialized studies, such as assessment of the impact by using standard scoring systems (e.g. Blackburn et al. 2014, Nentwig et al. 2016). New alien species are bound to arrive and spread in Turkey and we hope that publication of this list will encourage further recording so that the impacts of these species can be minimized.

Acknowledgments

PP and JP were supported by long-term research development project RVO 67985939 and Premium Academiae award to PP from The Czech Academy of Sciences. The authors also acknowledge support from the COST Action TD1209 “Alien Challenge” and FA1203 “SMARTER”. AU and NA have been supported partly by the ESENIAS-TOOLS project which is funded by the Financial Mechanism of the European Economic Area (2009–2014). We gratefully acknowledge G. Domina and two anonymous reviewers whose comments and suggestions greatly helped to improve the present research.

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Appendix I

Table A1. List of naturalized and casual alien taxa in the flora of Turkey. Taxa are ordered alphabetically. Each taxon is listed together with its family, residence time (Res: Arc = archaeophyte, Neo = neophyte); invasion status (Stat: Cas = casual, Nat = naturalized), simplified growth form and native range.

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Abutilon theophrastii</i> Medik.	Malvaceae	Arc	Nat	Herb	Asia
<i>Acacia dealbata</i> Link	Fabaceae	Neo	Cas	Tree	Australia
<i>Acacia karroo</i> Hayne	Fabaceae	Neo	Nat	Tree	Africa
<i>Acacia longifolia</i> (Andrews) Willd.	Fabaceae	Neo	Nat	Tree	Australia
<i>Acacia mearnsii</i> De Wild.	Fabaceae	Neo	Nat	Tree	Australia
<i>Acacia retinodes</i> Schltdl.	Fabaceae	Neo	Nat	Tree	Australia
<i>Acacia saligna</i> (Labill.) H.L.Wendl.	Fabaceae	Neo	Nat	Tree	Australia
<i>Acalypha australis</i> L.	Euphorbiaceae	Neo	Nat	Herb	Asia
<i>Acer buergerianum</i> Miq.	Sapindaceae	Neo	Nat	Tree	Asia
<i>Acer negundo</i> L.	Sapindaceae	Neo	Nat	Tree	America
<i>Acer palmatum</i> Thunb.	Sapindaceae	Arc	Nat	Tree	Asia
<i>Acer saccharum</i> Marsh.	Sapindaceae	Neo	Cas	Tree	America
<i>Acorus calamus</i> L.	Acoraceae	Arc	Nat	Aquatic	Asia
<i>Actinidia deliciosa</i> (A.Chev.) C.F.Liang & A.R.Ferguson	Actinidiaceae	Neo	Cas	Vine	Asia
<i>Aesculus carnea</i> J.Zeyh.	Sapindaceae	Neo	Nat	Tree	Garden/Hybrid
<i>Aesculus hippocastanum</i> L.	Sapindaceae	Neo	Nat	Tree	Europe
<i>Agave americana</i> L. var. <i>americana</i>	Asparagaceae	Neo	Nat	Succulent	America
<i>Agave americana</i> var. <i>striata</i> Trel.	Asparagaceae	Neo	Nat	Succulent	America
<i>Agrostemma githago</i> L.	Caryophyllaceae	Arc	Nat	Herb	Mediterranean
<i>Ailanthus altissima</i> (Mill.) Swingle	Simaroubaceae	Neo	Nat	Tree	Asia
<i>Albizia julibrissin</i> Durazz	Fabaceae	Neo	Nat	Tree	Asia
<i>Alternanthera sessilis</i> (L.) R.Br. ex DC.	Amaranthaceae	Neo	Nat	Herb	Asia
<i>Amaranthus albus</i> L.	Amaranthaceae	Arc	Nat	Herb	America
<i>Amaranthus blitoides</i> S.Watson	Amaranthaceae	Arc	Nat	Herb	America
<i>Amaranthus blitum</i> L. subsp. <i>blitum</i>	Amaranthaceae	Arc	Nat	Herb	Eurasia
<i>Amaranthus blitum</i> subsp. <i>emarginatus</i> (Salzm. ex Uline & Bray) Carretero, Muñoz Garm. & Pedrol	Amaranthaceae	Arc	Nat	Herb	Eurasia
<i>Amaranthus blitum</i> subsp. <i>oleraceus</i> (L.) Costea	Amaranthaceae	Arc	Nat	Herb	Eurasia
<i>Amaranthus cruentus</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Amaranthus deflexus</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Amaranthus graecizans</i> L.	Amaranthaceae	Neo	Nat	Herb	Mediterranean
<i>Amaranthus hybridus</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Amaranthus hypochondriacus</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Amaranthus retroflexus</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Amaranthus spinosus</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Amaranthus viridis</i> L.	Amaranthaceae	Neo	Nat	Herb	America
<i>Ambrosia artemisiifolia</i> L.	Asteraceae	Neo	Nat	Herb	America
<i>Ambrosia tenuifolia</i> Spreng.	Asteraceae	Neo	Nat	Herb	America

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Ammannia coccinea</i> Rottb.	<i>Lythraceae</i>	Neo	Nat	Herb	America
<i>Amorpha fruticosa</i> L.	<i>Fabaceae</i>	Neo	Cas	Shrub	America
<i>Araujia sericifera</i> Brot.	<i>Apocynaceae</i>	Neo	Nat	Vine	America
<i>Armeria maritima</i> (Mill.) Willd.	<i>Plumbaginaceae</i>	Arc	Cas	Herb	Europe
<i>Artemisia annua</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	Asia
<i>Artemisia verlotiorum</i> Lamotte	<i>Asteraceae</i>	Neo	Nat	Herb	Asia
<i>Arundo donax</i> L.	<i>Poaceae</i>	Arc	Nat	Bambusoid	Asia
<i>Aster subulatus</i> (Michx.) Hort. ex Michx.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Avena byzantina</i> K.Koch	<i>Poaceae</i>	Arc	Cas	Herb	Garden/Hybrid
<i>Azolla filiculoides</i> Lam.	<i>Azollaceae</i>	Arc	Nat	Aquatic	America
<i>Bauhinia variegata</i> L.	<i>Fabaceae</i>	Neo	Nat	Tree	Asia
<i>Berberis veitchii</i> C.K.Schneid.	<i>Berberidaceae</i>	Arc	Nat	Shrub	Asia
<i>Berberis thunbergii</i> DC.	<i>Berberidaceae</i>	Arc	Nat	Shrub	Asia
<i>Bidens bipinnata</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	Asia
<i>Bidens campylotheca</i> Sch.Bip.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Bidens cernua</i> L. s.l.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Bidens frondosa</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Bougainvillea buttiana</i> Holttum & Standl.	<i>Nyctaginaceae</i>	Neo	Nat	Vine	America
<i>Bougainvillea glabra</i> Choisy	<i>Nyctaginaceae</i>	Neo	Cas	Vine	America
<i>Bougainvillea spectabilis</i> Willd.	<i>Nyctaginaceae</i>	Neo	Nat	Vine	America
<i>Brachychiton populneus</i> (Schott & Endl.) R.Br.	<i>Sterculiaceae</i>	Neo	Nat	Tree	Australia
<i>Bromus tectorum</i> L.	<i>Poaceae</i>	N/A	Nat	Herb	Eurasia
<i>Broussonetia papyrifera</i> (L.) L'Hér. ex Vent.	<i>Moraceae</i>	Neo	Nat	Tree	Asia
<i>Bryophyllum delagoense</i> (Eckl. & Zeyh.) Druce	<i>Crassulaceae</i>	Neo	Cas	Succulent	Africa
<i>Buddleja davidii</i> Franch.	<i>Scrophulariaceae</i>	Neo	Nat	Shrub	Asia
<i>Caesalpinia gilliesii</i> (Hook.) D.Dietr.	<i>Fabaceae</i>	Neo	Nat	Shrub	America
<i>Calendula officinalis</i> L.	<i>Asteraceae</i>	Arc	Nat	Herb	Eurasia
<i>Callistemon citrinus</i> (Curtis) Skeels	<i>Myrtaceae</i>	Neo	Cas	Tree	Australia
<i>Callistemon viminalis</i> (Sol. ex Gaertn.) G.Don	<i>Myrtaceae</i>	Neo	Cas	Tree	Australia
<i>Camellia japonica</i> L.	<i>Theaceae</i>	Arc	Nat	Shrub	Asia
<i>Canna indica</i> L.	<i>Cannaceae</i>	Neo	Nat	Bambusoid	America
<i>Caragana arborescens</i> Lam.	<i>Fabaceae</i>	Neo	Nat	Shrub/Tree	Asia
<i>Carex vulpinoidea</i> Michx.	<i>Cyperaceae</i>	Neo	Nat	Herb	America
<i>Carpobrotus acinaciformis</i> (L.) L.Bolus	<i>Aizoaceae</i>	Neo	Nat	Succulent	Africa
<i>Carpobrotus edulis</i> (L.) N.E.Br.	<i>Aizoaceae</i>	Neo	Nat	Succulent	Africa
<i>Carthamus tinctorius</i> L.	<i>Asteraceae</i>	Arc	Cas	Herb	Asia
<i>Cascabela thevetia</i> (L.) Lippold	<i>Apocynaceae</i>	Neo	Cas	Tree	America
<i>Catalpa bignonioides</i> Walter	<i>Bignoniaceae</i>	Neo	Nat	Tree	America
<i>Cedrus atlantica</i> (Endl.) Carrière	<i>Pinaceae</i>	Neo	Cas	Tree	Africa
<i>Cedrus deodara</i> (Roxb. ex D.Don) G.Don	<i>Pinaceae</i>	Neo	Nat	Tree	Asia
<i>Ceiba speciosa</i> (A.St.-Hil.) Ravenna	<i>Malvaceae</i>	Neo	Nat	Tree	America
<i>Cenchrus incertus</i> M.A.Curtis	<i>Poaceae</i>	Arc	Nat	Herb	America
<i>Centaurea pullata</i> L.	<i>Asteraceae</i>	Arc	Nat	Herb	Mediterranean
<i>Chaenomeles japonica</i> (Thunb.) Lindl. ex Spach	<i>Rosaceae</i>	Neo	Cas	Shrub	Asia
<i>Chenopodium album</i> L.	<i>Amaranthaceae</i>	Arc	Nat	Herb	Eurasia

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Chenopodium giganteum</i> D.Don	<i>Chenopodiaceae</i>	Arc	Nat	Herb	Asia
<i>Cichorium endivia</i> L.	<i>Asteraceae</i>	Arc	Cas	Herb	Asia
<i>Citrullus colocynthis</i> (L.) Schrad.	<i>Cucurbitaceae</i>	Arc	Cas	Vine	Eurasia
<i>Citrus trifoliata</i> L.	<i>Rutaceae</i>	Neo	Cas	Tree	Asia
<i>Coix lacryma-jobi</i> L.	<i>Poaceae</i>	Neo	Nat	Herb	Asia
<i>Commelina communis</i> L.	<i>Commelinaceae</i>	Neo	Nat	Herb	Asia
<i>Convolvulus tricolor</i> L.	<i>Convolvulaceae</i>	Arc	Cas	Vine	Mediterranean
<i>Cortaderia selloana</i> (Schult. & Schult.f.) Asch. & Graebn.	<i>Poaceae</i>	Neo	Cas	Bambusoid	America
<i>Cosmos bipinnatus</i> Cav.	<i>Asteraceae</i>	Neo	Cas	Herb	America
<i>Cotoneaster adpressus</i> Bois	<i>Rosaceae</i>	Neo	Cas	Shrub	Asia
<i>Cotoneaster franchetii</i> Bois	<i>Rosaceae</i>	Neo	Nat	Shrub	Asia
<i>Cotoneaster horizontalis</i> Decne.	<i>Rosaceae</i>	Neo	Nat	Shrub	Asia
<i>Cotoneaster salicifolius</i> Franch.	<i>Rosaceae</i>	Arc	Nat	Shrub	Asia
<i>Crassocephalum crepidioides</i> (Benth.) S.Moore	<i>Asteraceae</i>	Neo	Nat	Herb	Africa
<i>Cryptomeria japonica</i> (Thunb. ex L.f.) D.Don	<i>Cupressaceae</i>	Neo	Cas	Tree	Asia
<i>Cupressus arizonica</i> Greene	<i>Cupressaceae</i>	Neo	Nat	Tree	America
<i>Cupressus macrocarpa</i> Hartw.	<i>Cupressaceae</i>	Neo	Nat	Tree	America
<i>Cuscuta campestris</i> Yunck.	<i>Cuscutaceae</i>	Neo	Nat	Herb	America
<i>Cymbalaria muralis</i> P.Gaertn., B.Mey. & Scherb.	<i>Plantaginaceae</i>	Arc	Nat	Herb	Mediterranean
<i>Cynoglossum wallichii</i> var. <i>glochidiatum</i> (Wall. ex Benth.) Kazmi	<i>Boraginaceae</i>	Arc	Nat	Herb	Asia
<i>Cyperus congestus</i> Vahl	<i>Cyperaceae</i>	Neo	Nat	Herb	Africa
<i>Cyperus esculentus</i> L.	<i>Cyperaceae</i>	Arc	Nat	Herb	Unknown
<i>Cyperus rotundus</i> L.	<i>Cyperaceae</i>	Arc	Nat	Herb	Eurasia
<i>Dalbergia sissoo</i> DC.	<i>Fabaceae</i>	Neo	Cas	Tree	Asia
<i>Datura innoxia</i> Mill.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Datura metel</i> L.	<i>Solanaceae</i>	Neo	Cas	Herb	Asia
<i>Datura stramonium</i> L.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Deutzia gracilis</i> Siebold & Zucc.	<i>Hydrangeaceae</i>	Arc	Nat	Shrub	Asia
<i>Deutzia scabra</i> Thunb.	<i>Hydrangeaceae</i>	Neo	Nat	Shrub	Asia
<i>Dichondra repens</i> J.R.Forst. & G.Forst.	<i>Convolvulaceae</i>	Neo	Cas	Herb	Asia
<i>Dichrocephala integrifolia</i> (L.f.) Kuntze	<i>Asteraceae</i>	Neo	Nat	Herb	Africa & Asia
<i>Dieffenbachia seguine</i> (Jacq.) Schott	<i>Araceae</i>	Neo	Nat	Herb	America
<i>Digitaria sanguinalis</i> (L.) Scop.	<i>Poaceae</i>	Neo	Nat	Herb	Europe & Africa
<i>Diplachne fusca</i> (L.) P.Beauv.	<i>Poaceae</i>	Neo	Nat	Herb	Unknown
<i>Duchesnea indica</i> (Jacks.) Focke	<i>Rosaceae</i>	Neo	Cas	Herb	Asia
<i>Duranta erecta</i> L.	<i>Verbenaceae</i>	Neo	Nat	Shrub/Tree	America
<i>Dysphania ambrosioides</i> (L.) Mosyakin & Clemants	<i>Amaranthaceae</i>	Neo	Nat	Herb	America
<i>Dysphania botrys</i> (L.) Mosyakin & Clemants	<i>Amaranthaceae</i>	Arc	Nat	Herb	Eurasia
<i>Dysphania multifida</i> (L.) Mosyakin & Clemants	<i>Amaranthaceae</i>	Neo	Nat	Herb	America
<i>Echinochloa colonum</i> (L.) Link	<i>Poaceae</i>	Neo	Nat	Herb	Unknown
<i>Echinochloa oryzoides</i> (Ard.) Fritsch	<i>Poaceae</i>	Arc	Nat	Herb	Asia
<i>Echinopsis chamaecereus</i> H.Friedrich & Glaetzle	<i>Cactaceae</i>	Neo	Nat	Succulent	America

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Egeria densa</i> Planch.	<i>Hydrocharitaceae</i>	Neo	Nat	Aquatic	America
<i>Eichhornia crassipes</i> (Mart.) Solms	<i>Pontederiaceae</i>	Neo	Nat	Aquatic	America
<i>Elatine ambigua</i> Wight	<i>Elatinaceae</i>	Neo	Nat	Aquatic	Asia
<i>Eleusine indica</i> (L.) Gaertn.	<i>Poaceae</i>	Neo	Nat	Herb	Africa
<i>Elodea canadensis</i> Michx.	<i>Hydrocharitaceae</i>	Neo	Nat	Aquatic	America
<i>Elsholtzia ciliata</i> (Thunb.) Hyl.	<i>Lamiaceae</i>	Neo	Nat	Herb	Asia
<i>Eragrostis curvula</i> (Schrad.) Nees	<i>Poaceae</i>	Arc	Nat	Herb	Africa
<i>Erigeron annuus</i> (L.) Pers.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Erigeron bonariensis</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Erigeron canadensis</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Erigeron sumatrensis</i> Retz.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Erythrina crista-galli</i> L.	<i>Fabaceae</i>	Neo	Cas	Tree	America
<i>Erythrina flabelliformis</i> Kearney	<i>Fabaceae</i>	Neo	Cas	Tree	America
<i>Eucalyptus camaldulensis</i> Dehnh.	<i>Myrtaceae</i>	Neo	Cas	Tree	Australia
<i>Eucalyptus grandis</i> W.Hill	<i>Myrtaceae</i>	Neo	Cas	Tree	Australia
<i>Euonymus fortunei</i> (Turcz.) Hand.-Mazz.	<i>Celastraceae</i>	Arc	Nat	Shrub	Asia
<i>Euonymus japonicus</i> Thunb.	<i>Celastraceae</i>	Arc	Nat	Shrub/Tree	Asia
<i>Eupatorium cannabinum</i> L.	<i>Asteraceae</i>	Arc	Nat	Herb	Europe
<i>Euphorbia chamaesyce</i> L.	<i>Euphorbiaceae</i>	Neo	Nat	Herb	America
<i>Euphorbia heterophylla</i> L.	<i>Euphorbiaceae</i>	Neo	Cas	Herb	America
<i>Euphorbia humifusa</i> Willd.	<i>Euphorbiaceae</i>	Arc	Nat	Herb	Asia
<i>Euphorbia lagascae</i> Spreng.	<i>Euphorbiaceae</i>	Arc	Nat	Herb	Mediterranean
<i>Euphorbia lathyris</i> L.	<i>Euphorbiaceae</i>	Arc	Nat	Herb	Mediterranean
<i>Euphorbia nutans</i> Lag.	<i>Euphorbiaceae</i>	Neo	Nat	Herb	America
<i>Euphorbia prostrata</i> Aiton	<i>Euphorbiaceae</i>	Neo	Nat	Herb	America
<i>Euphorbia serpens</i> Kunth	<i>Euphorbiaceae</i>	Neo	Nat	Herb	America
<i>Euphorbia supina</i> Rafin.	<i>Euphorbiaceae</i>	Neo	Nat	Herb	America
<i>Fallopia aubertii</i> (L.Henry) Holub	<i>Polygonaceae</i>	Neo	Nat	Vine	Asia
<i>Fatsia japonica</i> (Thunb.) Decne. & Planch.	<i>Araliaceae</i>	Neo	Nat	Shrub/Tree	Asia
<i>Ficus elastica</i> Roxb. ex Hornem.	<i>Moraceae</i>	Neo	Cas	Tree	Asia
<i>Ficus macrophylla</i> Desf. ex Pers.	<i>Moraceae</i>	Neo	Cas	Tree	Australia
<i>Ficus microcarpa</i> L.f.	<i>Moraceae</i>	Neo	Cas	Tree	Asia
<i>Forsythia</i> × <i>intermedia</i> Zabel	<i>Oleaceae</i>	Neo	Cas	Shrub	Garden/Hybrid
<i>Fragaria</i> × <i>ananassa</i> (Duchesne ex Weston) Duchesne ex Rozier	<i>Rosaceae</i>	Neo	Cas	Herb	America
<i>Gaillardia pulchella</i> Foug.	<i>Asteraceae</i>	Neo	Cas	Herb	America
<i>Galinsoga ciliata</i> (Rafin) S.F. Blake	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Galinsoga parviflora</i> Cav.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Galinsoga quadriradiata</i> Ruiz & Pav.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Gasteria obliqua</i> (Aiton) Duval	<i>Xanthorrhoeaceae</i>	Neo	Cas	Succulent	Africa
<i>Gazania rigens</i> (L.) Gaertn.	<i>Asteraceae</i>	Neo	Cas	Herb	Africa
<i>Geranium pusillum</i> L.	<i>Geraniaceae</i>	Neo	Nat	Herb	Eurasia
<i>Gleditsia triacanthos</i> L.	<i>Fabaceae</i>	Neo	Cas	Tree	America
<i>Gomphocarpus fruticosus</i> (L.) W.T.Aiton	<i>Apocynaceae</i>	Neo	Nat	Herb	Africa
<i>Gypsophila elegans</i> M.Bieb.	<i>Caryophyllaceae</i>	Arc	Nat	Herb	Eurasia

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Gypsophila pilosa</i> Huds.	<i>Caryophyllaceae</i>	Arc	Nat	Herb	Asia
<i>Heliotropium curassavicum</i> L.	<i>Boraginaceae</i>	Neo	Nat	Herb	America
<i>Hemerocallis fulva</i> (L.) L.	<i>Hemerocallidaceae</i>	Neo	Nat	Herb	Asia
<i>Hibiscus trionum</i> L.	<i>Malvaceae</i>	Arc	Nat	Herb	Africa
<i>Homalocladium platycladum</i> (F.Muell.) L.H.Bailey	<i>Polygonaceae</i>	Neo	Cas	Shrub	Oceania
<i>Hoya carnosa</i> (L.f.) R.Br.	<i>Apocynaceae</i>	Neo	Cas	Vine	Asia
<i>Hydrangea macrophylla</i> (Thunb.) Ser.	<i>Hydrangeaceae</i>	Neo	Nat	Herb	Asia
<i>Hydrocotyle ramiflora</i> Maxim.	<i>Umbelliferae</i>	Neo	Nat	Aquatic	Asia
<i>Imperata cylindrica</i> (L.) Raeusch.	<i>Poaceae</i>	Neo	Nat	Herb	Asia
<i>Ipomoea nil</i> (L.) Roth	<i>Convolvulaceae</i>	Neo	Nat	Vine	America
<i>Ipomoea purpurea</i> (L.) Roth	<i>Convolvulaceae</i>	Neo	Nat	Vine	America
<i>Ipomoea tricolor</i> Cav.	<i>Convolvulaceae</i>	Neo	Nat	Vine	America
<i>Ipomoea triloba</i> L.	<i>Convolvulaceae</i>	Neo	Nat	Vine	America
<i>Jacaranda mimosifolia</i> D.Don	<i>Bignoniaceae</i>	Neo	Cas	Tree	America
<i>Juncus tenuis</i> Willd.	<i>Juncaceae</i>	Neo	Nat	Herb	America
<i>Juniperus chinensis</i> L.	<i>Cupressaceae</i>	Neo	Nat	Shrub/Tree	Asia
<i>Juniperus horizontalis</i> Moench	<i>Cupressaceae</i>	Neo	Nat	Shrub	America
<i>Justicia brandegeana</i> Wassh. & L.B.Sm.	<i>Acanthaceae</i>	Neo	Cas	Shrub	America
<i>Kalanchoe blossfeldiana</i> Poelln.	<i>Crassulaceae</i>	Neo	Cas	Succulent	Africa (Madagascar)
<i>Kerria japonica</i> (L.) DC.	<i>Rosaceae</i>	Neo	Cas	Shrub	Asia
<i>Kniphofia uvaria</i> (L.) Oken	<i>Liliaceae</i>	Neo	Cas	Succulent	Africa
<i>Koelreuteria paniculata</i> Laxm.	<i>Sapindaceae</i>	Neo	Cas	Tree	Asia
<i>Lagerstroemia indica</i> L.	<i>Lythraceae</i>	Neo	Cas	Tree	Asia
<i>Lantana camara</i> L.	<i>Verbenaceae</i>	Neo	Cas	Shrub	America
<i>Lepidium virginicum</i> L.	<i>Brassicaceae</i>	Neo	Nat	Herb	America
<i>Leucaena leucocephala</i> (Lam.) de Wit	<i>Fabaceae</i>	Neo	Cas	Tree	America
<i>Ligustrum ovalifolium</i> Hassk.	<i>Oleaceae</i>	Neo	Cas	Shrub/Tree	Asia
<i>Liquidambar styraciflua</i> L.	<i>Altingiaceae</i>	Neo	Cas	Tree	America
<i>Livistona mariae</i> F.Muell.	<i>Arecaceae</i>	Neo	Cas	Palm	Australia
<i>Lonicera japonica</i> Thunb.	<i>Caprifoliaceae</i>	Neo	Cas	Vine	Asia
<i>Lonicera ligustrina</i> var. <i>yunnanensis</i> Franch.	<i>Caprifoliaceae</i>	Neo	Cas	Vine	Asia
<i>Lonicera periclymenum</i> L.	<i>Caprifoliaceae</i>	Neo	Nat	Vine	Europe & NW Africa
<i>Ludwigia peploides</i> (Kunth) P.H.Raven s.l.	<i>Onagraceae</i>	Neo	Cas	Aquatic	America
<i>Lycianthes rantonnei</i> (Carrière) Bitter	<i>Solanaceae</i>	Neo	Nat	Shrub	America
<i>Lysimachia japonica</i> Thunb.	<i>Primulaceae</i>	Neo	Nat	Herb	Asia
<i>Maclura pomifera</i> (Raf.) C.K.Schneid.	<i>Moraceae</i>	Neo	Nat	Tree	America
<i>Magnolia grandiflora</i> L.	<i>Magnoliaceae</i>	Neo	Cas	Tree	America
<i>Malus floribunda</i> Siebold ex Van Houtte	<i>Rosaceae</i>	Arc	Nat	Shrub/Tree	Asia
<i>Matricaria discoidea</i> DC.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Matricaria matricarioides</i> (Less.) Porter	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Melia azedarach</i> L.	<i>Meliaceae</i>	Neo	Nat	Tree	Asia
<i>Mesembryanthemum cordifolium</i> L.f.	<i>Aizoaceae</i>	Neo	Nat	Succulent	Africa
<i>Mesembryanthemum crystallinum</i> L.	<i>Aizoaceae</i>	Neo	Nat	Succulent	Africa

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Mesembryanthemum nodiflorum</i> L.	<i>Aizoaceae</i>	Arc	Nat	Succulent	Mediterranean & S Africa
<i>Microstegium vimineum</i> (Trin.) A.Camus	<i>Poaceae</i>	Neo	Nat	Herb	Asia
<i>Mirabilis jalapa</i> L.	<i>Nyctaginaceae</i>	Neo	Cas	Herb	America
<i>Miscanthus sinensis</i> Andersson	<i>Poaceae</i>	Neo	Cas	Bambusoid	Asia
<i>Myriophyllum spicatum</i> L.	<i>Haloragaceae</i>	Neo	Cas	Aquatic	Eurasia
<i>Myriophyllum verticillatum</i> L.	<i>Haloragaceae</i>	Neo	Cas	Aquatic	Circumboreal
<i>Nandina domestica</i> Thunb.	<i>Berberidaceae</i>	Neo	Cas	Bambusoid	Asia
<i>Nephrolepis exaltata</i> (L.) Schott	<i>Nephrolepidaceae</i>	Neo	Cas	Fern	America
<i>Nicotiana glauca</i> Graham	<i>Solanaceae</i>	Neo	Nat	Shrub/Tree	America
<i>Oenothera biennis</i> L.	<i>Onagraceae</i>	Neo	Nat	Herb	America
<i>Oenothera glazioviana</i> Micheli	<i>Onagraceae</i>	Neo	Nat	Herb	Garden/Hybrid
<i>Oenothera parodiana</i> Munz	<i>Onagraceae</i>	Neo	Nat	Herb	America
<i>Oldenlandia capensis</i> L.f. var. <i>capensis</i>	<i>Rubiaceae</i>	Neo	Nat	Herb	Africa
<i>Oldenlandia capensis</i> var. <i>pleiosepala</i> Bremek.	<i>Rubiaceae</i>	Neo	Cas	Herb	Africa
<i>Opuntia ficus-indica</i> (L.) Mill.	<i>Cactaceae</i>	Neo	Nat	Succulent	America
<i>Opuntia microdasys</i> (Lehm.) Pfeiff.	<i>Cactaceae</i>	Neo	Nat	Succulent	America
<i>Oryza sativa</i> L.	<i>Poaceae</i>	Arc	Cas	Herb	Asia
<i>Oxalis articulata</i> Savigny	<i>Oxalidaceae</i>	Neo	Nat	Herb	America
<i>Oxalis corniculata</i> L. s.l.	<i>Oxalidaceae</i>	Arc	Nat	Herb	America
<i>Oxalis debilis</i> var. <i>corymbosa</i> (DC.) Lourteig	<i>Oxalidaceae</i>	Neo	Nat	Herb	America
<i>Oxalis floribunda</i> Lehm.	<i>Oxalidaceae</i>	Neo	Nat	Herb	America
<i>Oxalis pes-caprae</i> L.	<i>Oxalidaceae</i>	Neo	Nat	Herb	Africa
<i>Oxalis pes-caprae</i> f. <i>pleniflora</i> (Lowe) Sunding	<i>Oxalidaceae</i>	Neo	Nat	Herb	Africa
<i>Oxalis stricta</i> L.	<i>Oxalidaceae</i>	Neo	Nat	Herb	America
<i>Panicum capillare</i> L.	<i>Poaceae</i>	Neo	Nat	Herb	America
<i>Panicum miliaceum</i> L.	<i>Poaceae</i>	Arc	Nat	Herb	Asia
<i>Parkinsonia aculeata</i> L.	<i>Fabaceae</i>	Neo	Cas	Tree	America
<i>Parthenocissus quinquefolia</i> (L.) Planch.	<i>Vitaceae</i>	Neo	Cas	Vine	America
<i>Paspalum dilatatum</i> Poir.	<i>Poaceae</i>	Neo	Nat	Herb	America
<i>Paspalum distichum</i> L.	<i>Poaceae</i>	Neo	Nat	Herb	America
<i>Paspalum thunbergii</i> Kunth ex Steud	<i>Poaceae</i>	Arc	Cas	Herb	Asia
<i>Passiflora caerulea</i> L.	<i>Passifloraceae</i>	Neo	Cas	Vine	America
<i>Paulownia elongata</i> S. Y. Hu.	<i>Paulowniaceae</i>	Neo	Cas	Tree	Asia
<i>Paulownia fortunei</i> (Seem.) Hemsl.	<i>Paulowniaceae</i>	Neo	Cas	Tree	Asia
<i>Paulownia fortunei</i> x <i>Paulownia tomentosa</i>	<i>Paulowniaceae</i>	Neo	Cas	Tree	Garden/Hybrid
<i>Paulownia tomentosa</i> Steud.	<i>Paulowniaceae</i>	Neo	Cas	Tree	Asia
<i>Pelargonium zonale</i> (L.) L'Hér. ex Aiton	<i>Geraniaceae</i>	Neo	Nat	Shrub	Africa
<i>Perilla frutescens</i> (L.) Britton	<i>Lamiaceae</i>	Neo	Cas	Herb	Asia
<i>Phacelia tanacetifolia</i> Benth.	<i>Hydrophyllaceae</i>	Neo	Cas	Herb	America
<i>Phaseolus vulgaris</i> L.	<i>Fabaceae</i>	Neo	Cas	Vine	America
<i>Phyla canescens</i> (Kunth) Greene	<i>Verbenaceae</i>	Neo	Nat	Herb	America
<i>Phyla nodiflora</i> (L.) Greene	<i>Verbenaceae</i>	Neo	Nat	Herb	America
<i>Phyllostachys bambusoides</i> Siebold & Zucc.	<i>Poaceae</i>	Neo	Nat	Bambusoid	Asia
<i>Physalis alkekengi</i> L. s.l.	<i>Solanaceae</i>	Neo	Nat	Herb	Eurasia

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Physalis angulata</i> L.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Physalis philadelphica</i> var. <i>immaculata</i> Waterf.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Physalis pubescens</i> L.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Phytolacca americana</i> L.	<i>Phytolaccaceae</i>	Neo	Nat	Herb	America
<i>Picea glauca</i> (Moench) Voss	<i>Pinaceae</i>	Neo	Nat	Tree	America
<i>Pinus pinaster</i> Aiton	<i>Pinaceae</i>	Arc	Nat	Tree	Mediterranean
<i>Pinus ponderosa</i> Douglas ex C.Lawson	<i>Pinaceae</i>	Neo	Nat	Tree	America
<i>Pinus radiata</i> D.Don	<i>Pinaceae</i>	Neo	Cas	Tree	America
<i>Pittosporum tobira</i> (Thunb.) W.T.Aiton	<i>Pittosporaceae</i>	Neo	Cas	Shrub	Asia
<i>Platycladus orientalis</i> (L.) Franco	<i>Cupressaceae</i>	Neo	Nat	Tree	Asia
<i>Plumbago auriculata</i> Lam.	<i>Plumbaginaceae</i>	Neo	Cas	Shrub	Africa
<i>Polygala myrtifolia</i> L.	<i>Polygalaceae</i>	Neo	Cas	Shrub	Africa
<i>Polygonum perfoliatum</i> L.	<i>Polygonaceae</i>	Neo	Nat	Vine	Asia
<i>Polygonum thunbergii</i> Siebold & Zucc.	<i>Polygonaceae</i>	Arc	Nat	Herb	Asia
<i>Populus</i> × <i>canadensis</i> Moench	<i>Salicaceae</i>	Neo	Nat	Tree	Garden/Hybrid
<i>Populus deltoides</i> Bartr. ex Marsh.	<i>Salicaceae</i>	Neo	Nat	Tree	America
<i>Portulaca grandiflora</i> Hook.	<i>Portulacaceae</i>	Neo	Cas	Herb	America
<i>Portulaca oleracea</i> L. s.l.	<i>Portulacaceae</i>	Arc	Nat	Herb	Mediterranean
<i>Pseudosasa japonica</i> (Steud.) Makino	<i>Poaceae</i>	Neo	Cas	Bambusoid	Asia
<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>menziesii</i>	<i>Pinaceae</i>	Neo	Cas	Tree	America
<i>Pseudotsuga menziesii</i> (Mirb.) Franco var. <i>glauca</i> (Beissn.) Franco	<i>Pinaceae</i>	Neo	Cas	Tree	America
<i>Quercus rubra</i> L.	<i>Fagaceae</i>	Neo	Cas	Tree	America
<i>Rhapis excelsa</i> (Thunb.) Henry	<i>Arecaceae</i>	Neo	Nat	Palm	Asia
<i>Ricinus communis</i> L.	<i>Euphorbiaceae</i>	Arc	Nat	Shrub	Africa
<i>Robinia hispida</i> L.	<i>Fabaceae</i>	Neo	Cas	Tree	America
<i>Robinia pseudoacacia</i> L.	<i>Fabaceae</i>	Neo	Nat	Tree	America
<i>Rudbeckia hirta</i> L.	<i>Asteraceae</i>	Neo	Cas	Herb	America
<i>Russelia equisetiformis</i> Schltdl. & Cham.	<i>Plantaginaceae</i>	Neo	Cas	Shrub	America
<i>Salix babylonica</i> L.	<i>Salicaceae</i>	Neo	Nat	Tree	Asia
<i>Santolina chamaecyparissus</i> L.	<i>Asteraceae</i>	Arc	Nat	Herb	Mediterranean
<i>Saponaria officinalis</i> L.	<i>Caryophyllaceae</i>	Arc	Nat	Herb	Eurasia
<i>Schefflera arboricola</i> (Hayata) Merr.	<i>Araliaceae</i>	Neo	Cas	Shrub	Asia
<i>Schinus molle</i> L.	<i>Anacardiaceae</i>	Neo	Cas	Tree	America
<i>Schinus terebinthifolius</i> Raddi	<i>Anacardiaceae</i>	Neo	Cas	Tree	America
<i>Scopolia carniolica</i> Jacq.	<i>Solanaceae</i>	Arc	Nat	Herb	Europe
<i>Sequoia sempervirens</i> (D.Don) Endl.	<i>Cupressaceae</i>	Neo	Cas	Tree	America
<i>Sequoiadendron giganteum</i> (Lindl.) J.Buchholz	<i>Cupressaceae</i>	Neo	Cas	Tree	America
<i>Setaria faberi</i> R.A.W.Herrm.	<i>Poaceae</i>	Neo	Nat	Herb	Asia
<i>Setaria italica</i> (L.) P.Beauv.	<i>Poaceae</i>	N/A	Nat	Herb	Unknown
<i>Setaria viridis</i> (L.) P.Beauv.	<i>Poaceae</i>	Neo	Nat	Herb	Eurasia
<i>Sicyos angulatus</i> L.	<i>Cucurbitaceae</i>	Neo	Nat	Vine	America
<i>Sida spinosa</i> L.	<i>Malvaceae</i>	Neo	Nat	Herb	America
<i>Sigesbeckia pubescens</i> (Makino) Makino	<i>Asteraceae</i>	Neo	Cas	Herb	Asia
<i>Solanum americanum</i> Mill.	<i>Solanaceae</i>	N/A	Nat	Herb	Unknown

Taxa	Family	Res	Stat	Simplified growth form	Native range
<i>Solanum angustifolium</i> Mill.	<i>Solanaceae</i>	Neo	Cas	Herb	America
<i>Solanum elaeagnifolium</i> Cav.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Solanum jasminoides</i> J.Paxton	<i>Solanaceae</i>	Neo	Cas	Vine	America
<i>Solanum luteum</i> Mill. s.l.	<i>Solanaceae</i>	N/A	Nat	Herb	Mediterranean & E Asia
<i>Solanum lycopersicum</i> L.	<i>Solanaceae</i>	Neo	Cas	Herb	America
<i>Solanum pseudocapsicum</i> L.	<i>Solanaceae</i>	Neo	Cas	Herb	America
<i>Solanum pseudocapsicum</i> var. <i>difflorum</i> (Vell.) Bitter	<i>Solanaceae</i>	Neo	Cas	Herb	America
<i>Solanum sisymbriifolium</i> Lam.	<i>Solanaceae</i>	Neo	Nat	Herb	America
<i>Solanum sodomaeum</i> L.	<i>Solanaceae</i>	Neo	Nat	Shrub	Africa
<i>Solanum tuberosum</i> L.	<i>Solanaceae</i>	Neo	Cas	Herb	America
<i>Solidago canadensis</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Sorghum</i> × <i>drummondii</i> (Nees ex Steud.) Millsp. & Chase	<i>Poaceae</i>	Neo	Cas	Bambusoid	Garden/Hybrid
<i>Sorghum bicolor</i> (L.) Moench	<i>Poaceae</i>	Arc	Cas	Bambusoid	Africa
<i>Spiraea</i> × <i>vanhouttei</i> (Briot) Zabel	<i>Rosaceae</i>	Neo	Cas	Shrub	Garden/Hybrid
<i>Sporobolus fertilis</i> (Steud.) Clayton	<i>Poaceae</i>	Neo	Nat	Herb	Asia
<i>Sporobolus indicus</i> (L.) R.Br.	<i>Poaceae</i>	Neo	Nat	Herb	America
<i>Strelitzia reginae</i> Banks	<i>Strelitziaceae</i>	Neo	Cas	Herb	Africa
<i>Styphnolobium japonicum</i> (L.) Schott	<i>Fabaceae</i>	Neo	Cas	Tree	Asia
<i>Symphotrichum laeve</i> (L.) Á.Löve & D.Löve	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Symphotrichum squamatum</i> (Spreng.) G.L.Nesom	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Syringa vulgaris</i> L.	<i>Oleaceae</i>	Neo	Nat	Shrub	Europe
<i>Tagetes erecta</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Tagetes minuta</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Tecoma capensis</i> (Thunb.) Lindl.	<i>Bignoniaceae</i>	Neo	Cas	Vine	Africa
<i>Thuja plicata</i> Donn ex D.Don	<i>Cupressaceae</i>	Neo	Nat	Tree	America
<i>Tradescantia fluminensis</i> Vell.	<i>Commelinaceae</i>	Neo	Nat	Herb	America
<i>Tradescantia pallida</i> (Rose) D.R.Hunt	<i>Commelinaceae</i>	Neo	Cas	Herb	America
<i>Tropaeolum majus</i> L.	<i>Tropaeolaceae</i>	Neo	Nat	Vine	America
<i>Ulex europaeus</i> L.	<i>Fabaceae</i>	Neo	Nat	Shrub	Europe
<i>Veronica persica</i> Poir.	<i>Plantaginaceae</i>	Neo	Nat	Herb	Asia
<i>Vinca minor</i> L.	<i>Apocynaceae</i>	Arc	Nat	Herb	Europe
<i>Vitis riparia</i> Michx s.l.	<i>Vitaceae</i>	Neo	Cas	Vine	America
<i>Washingtonia robusta</i> H.Wendl.	<i>Arecaceae</i>	Neo	Cas	Palm	America
<i>Weigela florida</i> (Bunge) A.DC.	<i>Caprifoliaceae</i>	Neo	Nat	Shrub	Asia
<i>Wisteria sinensis</i> (Sims) Sweet	<i>Fabaceae</i>	Neo	Nat	Vine	Asia
<i>Withania somnifera</i> (L.) Dunal	<i>Solanaceae</i>	Arc	Nat	Shrub	Asia
<i>Xanthium spinosum</i> L.	<i>Asteraceae</i>	Neo	Nat	Herb	America
<i>Xanthium strumarium</i> L. s.l.	<i>Asteraceae</i>	Arc	Nat	Herb	America
<i>Yucca gloriosa</i> L.	<i>Asparagaceae</i>	Neo	Cas	Succulent	America
<i>Zantedeschia aethiopica</i> (L.) Spreng.	<i>Araceae</i>	Neo	Cas	Herb	Africa
<i>Zizyphus mauritiana</i> Lamk.	<i>Rhamnaceae</i>	Arc	Nat	Shrub/Tree	Asia

Supplementary material I

Alien flora of Turkey: checklist, taxonomic composition and ecological attributes

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Data type: List of alien plants

Explanation note: List of alien taxa in the flora of Turkey. Taxa are ordered alphabetically. Each taxon is listed together with its family, residence time, invasion status, life-form according to Raunkiaer, growth form according to the Thesaurus of Plant Characteristics for Ecology and Evolution, simplified growth-form, life history, reasons for intentional and accidental introduction. The last five columns on the right list habitats where the species is found in Turkey. This list includes also 47 frequently planted taxa.

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